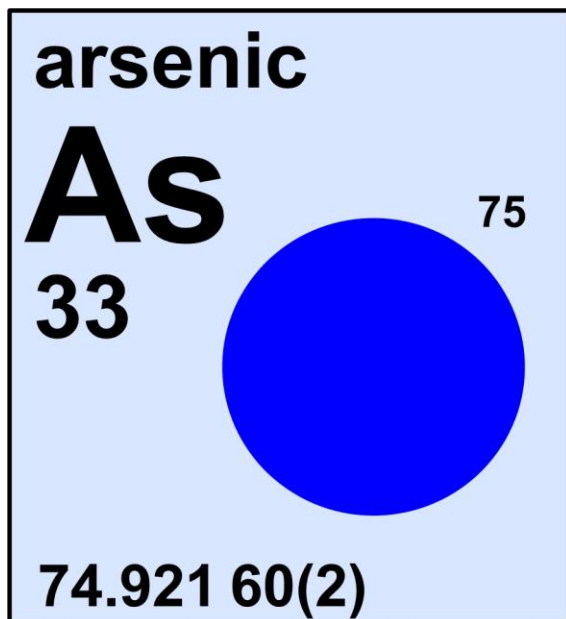



## arsenic





| Stable isotope   | Atomic mass* | Mole fraction |
|------------------|--------------|---------------|
| <sup>75</sup> As | 74.921 5965  | 1.0000        |

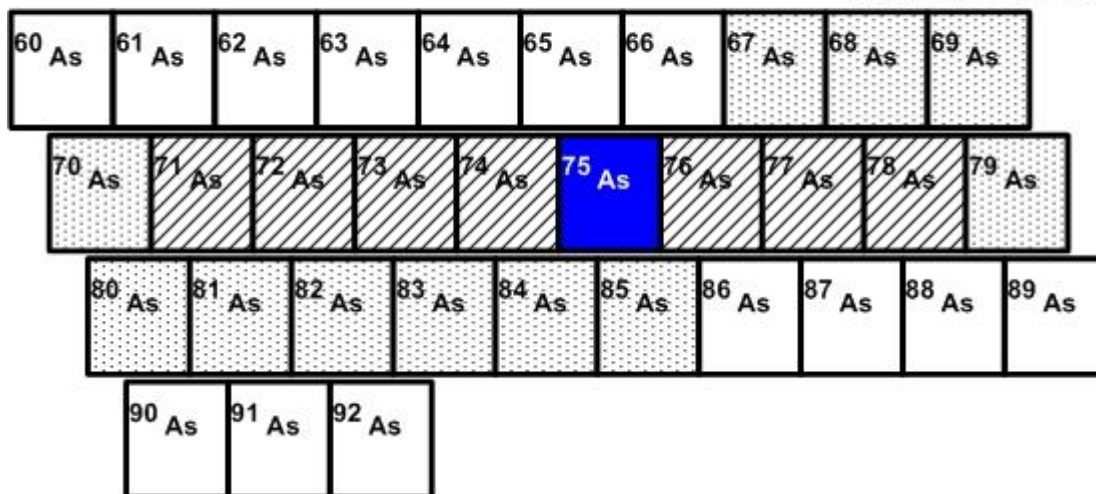
\* Atomic mass given in unified atomic mass units, u.

### Half-life of radioactive isotope

Less than 1 second 

Between 1 second and 1 hour 

Greater than 1 hour 



## Important applications of stable and/or radioactive isotopes

### Isotopes in medicine

- 1) <sup>72</sup>As and <sup>74</sup>As are positron emitters that have long half-lives (26hr and 17.77d respectively) and are a valuable asset in molecular imaging in vivo. These isotopes can be designed to bind to monoclonal antibodies (mab) which attach to and accumulate in tumors of interest. Once the mabs attach to the tumor, the <sup>72</sup>As or <sup>74</sup>As labeled ligands bind to the mabs and positron emission tomography (PET) is used to visualize the exact location of the tumor.
- 2) A specific example of using radio-labeled antibodies for better imaging of tumors is <sup>74</sup>As when combined with bavituximab. Bavituximab is an antibody that binds strongly to

unique lipids found on the surface of tumors. When a thiol group is introduced to bavituximab, arsenic is able to bind covalently, creating a simple and elegant radio-label for targeting cancerous tumors.

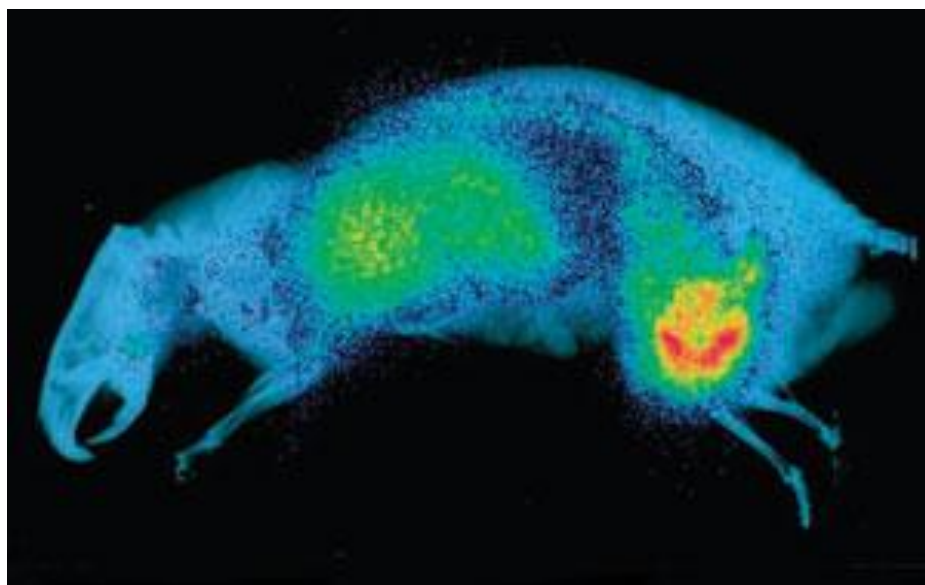


Figure 1: PET scan of a rat with tumors.

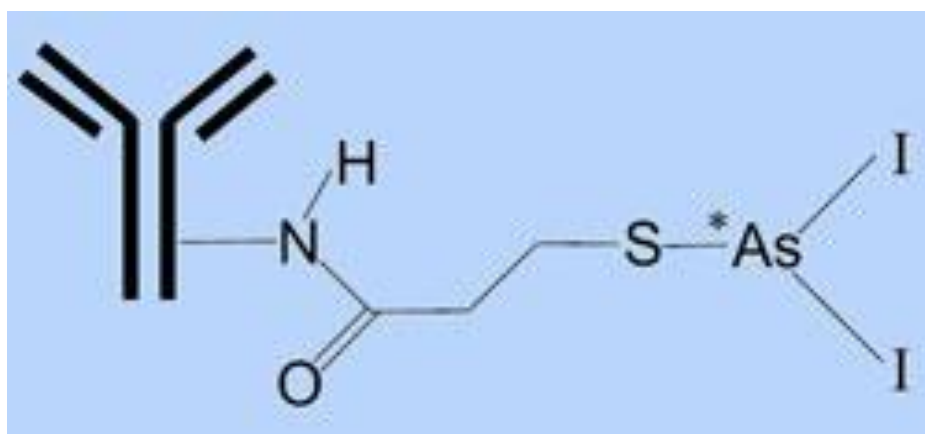


Figure 2: Arsenic labeled bavituximab antibody.

#### Isotopes in tracer studies

- 1)  $^{73}\text{As}$  and  $^{76}\text{As}$  are important radioactive tracers used in environmental and biomedical studies as a way to quantify arsenic uptake.
- 2)  $^{74}\text{As}$  has been used to investigate the biotransformation of arsenate by mammals. In one study rabbits were injected with  $^{74}\text{As}$ -labeled arsenate. After a given amount of time blood and blood products were sampled and tested for the presence and quantity of labeled arsenate metabolites.